UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
1 CONGRESS STREET, SUITE 1100
BOSTON, MASSACHUSETTS 02114-2023

October 1, 2001

Colonel Brian E. Osterndorf
New England District
U.S. Army Corps of Engineers
696 Virginia Road
Concord, Massachusetts 01742-2751

RE: Final Environmental Impact Statement for the Providence River and Harbor Maintenance Dredging Project (EPA ERP# COE-B32011-RI)

Dear Colonel Osterndorf:

In accordance with our responsibilities under the National Environmental Policy Act (NEPA), Section 404 of the Clean Water Act, Section 103 of the Marine Protection, Research and Sanctuaries Act (MPRSA) and Section 309 of the Clean Air Act, we have reviewed the Army Corps of Engineers' (Corps) Final Environmental Impact Statement (FEIS) for the proposed Providence River and Harbor Maintenance Dredging Project.

The goals of the proposed project remain consistent with those described in the Corps' 1998 Draft Environmental Impact Statement (DEIS). Namely, the project entails dredging approximately 4.3 million cubic yards of material from the federal channel to restore navigational efficiency and safety for deep draft vessels. The project also includes the removal of approximately 500,000 cubic yards of material associated with non-federal dredging projects. The FEIS describes proposed dredging activities and disposal options for both suitable and unsuitable material from the project and the likely environmental effects of the work.

The U.S. Environmental Protection Agency (EPA) continues to recognize the importance of the dredging and we are committed to work on the project as a top priority. Our comments below identify information we have requested several times that must be provided to allow us to meet our responsibilities with respect to section 103 (b) of the MPRSA and that we hope will demonstrate that the dredging and disposal activities will adequately protect the valuable resources of Narragansett Bay and Rhode Island Sound.

Our review of the FEIS focused on information provided in response to comments we offered on the DEIS, interim information provided by the Corps in support of the FEIS and an administrative copy of the FEIS. As you know, EPA's comments on the DEIS questioned the use of site 3 for the disposal of dredged material based on the potential for impacts to existing habitat at that site and other parts of the

bay, that were likely inconsistent with the Clean Water Act Section 404 (b)(1) Guidelines.

Our comments on the DEIS also praised the Corps for efforts to coordinate with federal and state agencies and interested stakeholder groups and suggested that continued coordination would be critical as project information continued to be developed. Since that time the Corps has made significant efforts to perform technical studies to support the analysis of impacts and has, for the most part, been very responsive to EPA's requests for information. In particular, we note that significant new information includes: the selection of a new preferred alternative for disposal of suitable material; lower impact alternatives (smaller project dimensions); revised water quality and erosional modeling; dredging window/sequencing; an enhanced fishery impact analysis including additional shellfish and lobster data; temperature refuge assessments; a revised impact assessment on suspended solids effects on fish; a fishery economic analysis; a revised Section 103 b site selection analysis; a new dewatering site analysis; and a new Section 404 (b)(1) evaluation. The Corps efforts to share much of this information in draft form helped generate and sustain healthy discussions about many aspects of the project and has afforded the Corps the chance to respond to comments prior to the publication of the FEIS. As is often the case with large, complicated and controversial projects undergoing environmental review, however, there are a number of important outstanding issues that need to be fully addressed before the conclusion of the NEPA process and to fully inform our decision-making with respect to our site selection concurrence responsibilities under section 103 (b) of the MPRSA.

EPA's comments on the DEIS encouraged the Corps to consider preparing "a Supplemental EIS or to otherwise provide comparable supplemental information responsive to our comments, and those of others, that can be analyzed prior to final decisions concerning disposal of the dredged material." Although we continue to believe that the level of new information and analysis provided in the FEIS, including the selection of a new preferred disposal alternative, warranted the preparation of a Supplemental EIS, we think that the Corps' efforts to share prepublication information with state and federal agencies was a positive step in the right direction. However, because the FEIS contains significant new information, recommends a new disposal site, and continues to have substantive informational deficiencies, we believe the Corps should establish a means to respond to substantive comments from agencies and stakeholders prior to the conclusion of the NEPA process. One suggestion would be for the Corps to prepare a response to comments document and a draft Record of Decision that would be circulated widely for review. We look forward to additional coordination with the Corps to develop an acceptable approach.

We recommend that the issues discussed below and in the attachment[1], many of which were raised in our previous comment letters and coordination meetings with the Corps, be addressed by the Corps prior to the conclusion of the NEPA process.

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[1] For the most part, the attachment provides specific technical comments on Volumes I and II as well as Appendices P and L of the FEIS.

Preferred Alternative

Open Water Disposal

While we are pleased that Site 3 was dropped as the preferred alternative for the disposal of suitable material from the project, we are disappointed that the additional information we have been requesting about the new preferred alternative, site 69b, to fully explain the potential fishery impacts at that site was not provided in the FEIS. As you know, EPA commented on this issue in our comments on the administrative draft of the FEIS (April, 2001) and our comments (June 14, 2001) on the Section 103 (b) site selection analysis. Specifically, our letters requested:

- a more detailed assessment of fishing uses of site 69b including a description of site use by various fishing groups, type of gear, seasonality, and importance of bottom contours to existing fishing practices;
- an analysis to determine which fisheries (groundfish, lobster, gillnet, shellfish) might be more affected and why;
- a discussion of the effects of disposing of cohesive sediments on various types of fishing gear;
- information on whether the bathymetric changes with a new mound would preclude or impair certain types of fishing activities.

Unfortunately, we note little in the FEIS and the site selection analysis to respond to these requests. We continue to believe that fishery impacts of concern at site 69b relate to more than the economic impact to the industry described in the FEIS. On this point, we note a number of reviewers including fishermen have questioned the economic analysis saying it underestimates the true value of the fishery. We believe it deserves more than the general analysis provided in the FEIS. Also, while we found direct discussion with fishermen who use site 69b to be very informative about uses the site gets at certain times of the year, we note that little information of that nature was provided in the document.

The uncertainties about the nature of impacts of use of this site to fisheries and the fishing industry make it impossible for us to concur with the Section 103 (b) Site Selection evaluation at this time. While we acknowledge that disposal and fishing activities coexist at other dredge material disposal sites in New England waters we will need the additional information listed in this letter and requested in previous comment letters to decide whether disposal activities at site 69b will cause unacceptable adverse effects to fishing uses in this part of the ocean.

CAD Cells

EPA continues to support the disposal of the upper river's 1.2 million cy of unsuitable sediments in CAD cells as the best solution for this part of the project. We also recognize and applaud the Corps decision to relocate the CAD cells to avoid areas of local concern and controversy. Before the proposed CAD cell cap can be approved, however, the Corps must demonstrate whether there is enough dilution to meet the four hour mixing zone water quality requirement for the "capping" sediments

from sample areas G and H. To answer this question the FEIS relies on a simple analytical model which indicates there is adequate dilution of the sediments that will form the cap. Our review of this model indicates that it was not appropriately applied to the initial mixing determination and that the adequate dilution of the capping sediments may not occur. We found the results of the Corps' STFATE modeling of these same sediments to be a more reliable indicator of compliance. That modeling indicates failure to meet the mixing zone water quality requirement as it would take 4-5 hours to dilute a 1500-2000 cy discharge. We therefore request that the Corps provide additional model runs with further reduced barge volumes to determine initial mixing compliance. If supplemental modeling efforts do not show compliance with mixing zone criteria the Corps must identify where these sediments will be disposed and the source and quality of the new capping sediments for the CAD cells.

As you know, the "mixing zone" evaluation must be approved by the state DEM as part of their Water Quality Certification process. Zones for dredged material discharges have not been previously established by the state. Given that the STFATE model can under predict dilution, it is uncertain whether the discharge will be toxic to aquatic organisms in harbor waters. Therefore, we believe that the discharge plume should be monitored for toxicity or some suitable surrogate to establish compliance with the four hour mixing requirements.[2] We recommend that the Corps, EPA and RI DEM staff continue to work closely to resolve this issue as soon as possible.

Beneficial Reuse

Spar Island

EPA typically supports efforts to identify and develop beneficial reuse options for dredged material, such as restoring/enhancing nesting waterbird habitat. In this case, however, we cannot support the Spar Island disposal proposal if it will be at the expense of "important fish spawning and nursery habitat" as the EIS indicates would occur (FEIS page 7-125). In particular, we are concerned about the cumulative effects of this proposal on an already stressed winter flounder population and other species in Mount Hope Bay and we believe that this area best serves Rhode Island's fishery and wildlife resources by remaining shallow water fish habitat. Based on our understanding of the impacts associated with the proposed Spar Island discharge, we cannot concur that it complies with the Section 404 (b)(1) guidelines. We also note that this potentially significant impact/action was not included in the 404 (b)(1) evaluation in Volume II of the FEIS.

Dewatering Sites

We applaud the Corps' efforts to support beneficial reuse of appropriate dredged material for road construction or as general aggregate. The Corps should make every effort to design the project to avoid impacts to the small freshwater wetland east of the railroad tracks.

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[2] We also believe that a smaller mixing zone should be implemented for metals, since copper and silver are projected to meet standards or background within 500 feet of the discharge.

Dewatering facilities associated with upland disposal and beneficial reuse actions are briefly discussed in Section 7.2.5.1 of the FEIS but are not included in the 404 (b)(1) evaluation. The Corps should correct this deficiency and include an assessment of run-back from dewatering areas on the water quality of the bay. The Corps should also commit to monitor this type of discharge to insure compliance with state water quality standards.

404 (b)(1) Evaluation

In addition to our Section 404 concerns related to the Spar Island proposal and dewatering activities, we believe the EIS should have included a more comprehensive 404 (b)(1) analysis. The 404 short form provided is typically reserved for small projects where issues are generally of low concern while a more detailed format is reserved for more complicated and larger projects where the issues demand more analysis, referencing specific sections of the EIS, to show compliance with regulations. The 404 (b)(1) analysis should be provided in a format similar to the Section 103 (b) Site Selection Memorandum.

Windows/Sequencing (mitigation)

EPA is one of many agencies and stakeholders that, in response to the DEIS, expressed concerns about impacts to fish populations and habitat associated with the Providence River dredging project. As you know, Narragansett bay is recognized as one of the greatest cultural and economic resources of Rhode Island due almost entirely to its natural resources. Unfortunately, many of these same resources are already stressed making attention to construction (dredging) mitigation that much more important. Since the DEIS was published there has been a great deal of discussion about approaches to mitigate impacts to fish and shellfish in the dredging areas. Most of these measures focus on the use of dredging windows (time of year restrictions) and dredge sequencing. We continue to question whether dredge sequencing can effectively prevent and avoid impacts to fish populations and habitat and prefer the implementation of dredging windows instead. Dredging windows have been applied for many years in New England waters with great success for dredging projects where resources are at risk.

We recognize the Corps' interest in commencing work at the earliest possible time, now projected to be November 2002. If a dredge sequence is ultimately shown to adequately protect the resources and habitat of concern and is selected as the preferred mitigation measure, it must be carefully implemented with an April start date to avoid cumulative impacts associated with the potential loss of two consecutive winter flounder spawning seasons. Moreover, any sequencing plan should be developed with a contingency plan that explains how resource impacts will be avoided under a number of scenarios including, among other things: the unexpected presence of resources in an area scheduled for dredging; unplanned work stoppages due to weather/equipment breakage, etc. that have the effect of shifting the work "out of sequence"; and how real time monitoring of resource impacts can be used to modify the dredging program to avoid impacts. Without proper contingency planning, the sequencing approach may leave vulnerable resources unprotected during the dredging and disposal operations. The contingency plans should be developed in coordination with the National Marine Fisheries Service,

EPA, and RI DEM.

Monitoring

Our previous comments on the DEIS and the administrative draft of the FEIS requested specific monitoring plans relative to those impacts that are likely to be both significant and uncertain. The FEIS states the Corps' commitment to monitor site 69b as part of the ongoing DAMOS program. While this commitment is important, it should be expanded to include monitoring of dredging/CAD disposal effects in the lower Providence River, and erosion and fishery effects (including bioaccumulation) at Site 69 b. As part of these efforts we also request that the Corps' Record of Decision establish an interagency work group tasked with developing a comprehensive monitoring plan that addresses these important issues. This same group could also work to help develop dredging contingency plans for the work.

Conclusion

We urge the Corps to ensure that the concerns we have raised are addressed in a manner that helps us determine whether the project is consistent with section 103 (b) of the MPRSA and can subsequently proceed in a responsible manner with a minimum of environmental harm. EPA is prepared to devote the necessary resources to work intensively with the Corps over the next few months to gather and review information and resolve outstanding issues as soon as possible. To that end, we recommend as an immediate next step an interagency meeting to develop a short term plan and schedule for addressing the outstanding information needs and to begin discussions about monitoring, contingency planning, water quality issues and NEPA process requirements. We look forward to continuing to work with the Corps to analyze project impacts and to resolve outstanding issues associated with the proposal. Please feel free to call me at 617/918-1000, or Tim Timmermann of my staff at 617/918-1025 or David Tomey of the Office of Ecosystem Protection at 617/918-1627 if you wish to discuss these comments further.

Sincerely,

Robert W. Varney
Regional Administrator

attachment
cc:

Senator Lincoln Chafee
Senator Jack F. Reed
Governor Lincoln C. Almond
Michael Bartlett, United States Fish and Wildlife Service
copies furnished list (continued):

Patricia A. Kurkul, National Marine Fisheries Service
Jan Reitsma, RI Department of Environmental Management
Michael Tikoian, RI Coastal Resources Management Council

Additional Detailed Comments on the Final Environmental Impact Statement (FEIS) for the Providence River Maintenance Dredging Project

This technical attachment is based in part on evaluations supplied to EPA New England by the U.S. EPA Research Laboratory, Narragansett, Rhode Island, and our mission contractor, Metcalf and Eddy. The technical attachment is, where possible, organized to provide specific comments and questions about the FEIS and its appendices with specific references provided for the text or analysis in question.

VOLUME ONE

Section 4.5.2.4, p. 4-117, 118; Section 5.2.7, p 5-10, 5-11; and Section 7.6.7.5, Spar Island, p 7-125:

The Spar Island four-acre alternative involves dredging to get a barge in proximity to the island and 10,000 cy of fill around the existing grade. The description of impacts of this alternative were vague and not site-specific and lacked sufficient assessment to determine the cumulative effects to Mount Hope Bay fish populations.

Section 4.5.3.1, Cap Design for Disposal Site 3, p 4-125 through 4-130; and Section 7.2.3.6, Mitigation, p 7-49:

Despite the one meter thick cap proposed, we expect projected storm surges to erode the cap away over time. For that reason, we do not support capping unsuitable material at Site 3.

Section 4.6.1.1, Site 69 b, p 4-156, 1st full paragraph, 4th sentence:

The FEIS states that only major storms with frequencies of 100 year or greater will significantly erode the mound. While this may be true after consolidation, it should be pointed out here that the sediments are more susceptible to erosion during the 1st year after disposal with a range of one in ten to a one in forty percent frequency when the water content of the mound sediments are higher.

Section 4.6.2.1, Sediment Type, p 4-172, 1st paragraph, last sentence:

The grain size distribution may be comparable in silt, but differs in clay content. This difference is enough to make the sediments "unconsolidated" at the disposal site vs. "cohesive" at the dredging site. The recolonized community may include a different mix and abundance of species because of the more *mushy* characteristic of the dredged material in contrast to native fines. Unfortunately, as noted in the FEIS, there is no grain size data to allow for comparisons between the dredged material and native sediments.

Section 5.4:

Uncertainty in numerical modeling emphasizes the need for extensive monitoring, both at the dredging site and the disposal site. The FEIS states that "A detailed monitoring plan will be developed.." (page 5-13). We encourage the Corps to conduct baseline studies before the dredging and disposal takes place. The monitoring plan should include provisions for temporarily closing down the project if monitoring shows

that the modeling was not accurate, and that unacceptable biological impacts are resulting from the dredging or disposal, or that water quality standards are being violated as a result of the work.

Section 5.4.1, p 5-14:
The FEIS states that "LC50 would not be practical." Presumably this means that *"Determination of LC50 using toxicity testing would not be practical."* This is true in terms of "real-time" testing, because the tests are expensive and can take days to conduct. But we do not see why some representative toxicity testing could not be done. We believe that such monitoring is practical. The monitoring would involve collecting water samples near the edge of the mixing zone and subjecting those samples to water column toxicity tests. These results can be used to modify discharges after the results become available. Even though there is a time lag involved, we do not believe that such testing would not be practical. Such practices have been used for other projects such as New Bedford and Boston.

Section 5.4.1, 4th bullet:
The FEIS states that, *"There are two background conditions..." one with dredging and one without*. Please further explain what this means relative to the monitoring plan.

Section 5.4.2:
The FEIS states that it is not appropriate to do bioaccumulation testing at the disposal site until the biota have recovered sufficiently to have large-bodied benthos there in sufficient quantity for analysis, which may take a few years. Beyond that there is only very cursory mention of biological testing at the disposal site, including the deployment of a sediment profile camera. We expect the Corps will require a baseline characterization when a monitoring plan is developed and before disposal begins. This may include toxicity testing, measurements of bioaccumulation, and benthic community analysis. This monitoring should follow, and take into account, the successional changes at the disposal site.

Section 7.2.1.2, Estimated Erosion...Rhode Island Sound, p 7-11 through 7-13:
The modeling performed to address storm erosion indicated that the site will be relatively stable for the long term except during the most extreme storms such as the 1933 and 1944 hurricanes (unnamed) that exhibited the most erosive conditions for Rhode Island Sound. This is due primarily to the extremely cohesive nature of the Providence River sediments.

We note that the modeling did not include an assessment of sediment movement during the 1-2 year consolidation period when the sediments may be not as cohesive (as requested in our April 2, 2001 letter). We request that you estimate how far from the boundaries of the dump site eroded material will travel, and how thick the deposits would be especially with regard to pre-consolidated sediments. Appendix P (see comments on consolidation below) indicates likelihood of such an event would be about 1 in 20-40. It is not clear what level of erosion would likely occur under such conditions. Further, it is unclear whether the subsequent re-deposition on or offsite would be significant in terms of depth and area.

Section 7.2.1, p 7-2, 1st full paragraph, last sentence ("Much of...):
As requested in our April 2, 2001 letter, this section of the analysis should explain that new modeling at site 3 indicates that storm surge projections show erosion of deposited sediments or the cap (as discussed on p. 7-13).

Section 7.2.2.5, Effect of Disposal Operations.., p 7-28, 2nd paragraph:
Please clarify whether this loss and deposition applies to all three sites evaluated.

Section 7.2.3.3, STFATE Modeling of CAD Cell Disposal, p 7-42:
Please see comments below on Appendix P, p 22-24.

Mixing Zone for CAD Cell Disposal, Mixing Zone Requirements, p 7-42:
"The dredged material constituent...dictates the mixing zone size." As we stated at a number of project coordination meetings on this issue, it is our policy that mixing zones are **not** sized to meet water quality standards. Our Toxics Control guidelines indicate that mixing zones should be sized to: (1) prevent mortality of a passing organism, (2) prevent impairment of water body integrity and (3) insure no significant health risks. The analysis should be revised accordingly.

Section 7.2.3.3, Mixing Zone for CAD Cell Disposal, p 7-42, Volume II, Mixing Zone Requirements, 3rd paragraph, p 8-19, 1st complete paragraph and p 8-29, Section 5.0 Mixing Zone Conclusions:
These sections indicate that a mixing zone of 1.5 miles was selected to meet the 1/100 of the LC50, the criterion requiring the greatest dilution. To avoid mortality to winter flounder, disposal in the CAD cells would be excluded from Feb. 1 through April 30. Compliance with acute water quality criteria are generally based on a 1 hr exposure period and acute mixing zones are usually sized to assure that drifting organisms will pass thru the mixing zone in less than 1hr. Notwithstanding our comments on initial mixing, it is not clear that such a large mixing zone, with a float through time that would likely exceed 1 hour, is appropriate for the metals copper or silver. Table 7.2.3.1, the text on p. 8-19, 3rd complete paragraph and Table 3 on the same page indicate that a mixing zone of less than 500 ft. is necessary to meet the water quality criteria for copper and silver. To minimize the potential for impacts, the Corps should identify a smaller mixing zone for copper and silver and document its consistency with RI's criteria for mixing zones.

The Corps proposes that a detailed monitoring plan will be developed in cooperation with RIDEM, EPA and other cooperating/regulatory agencies following public review. It is important that this monitoring plan be sufficient for evaluating compliance with all aspects of the proposed mixing zones, including the LC50.

Section 7.2.5.1, Effluent from Dewatering Sites, p 7-62 through 7-63:
The most appropriate assessment tool to evaluate the effluent water quality is the modified elutriate test in Appendix B of the Inland Testing Manual. We note the Corps used the already available standard

elutriate test data to evaluate potential impacts. In lieu of more pertinent data, we strongly suggest that the discharge be monitored for total suspended solids and metals from the effluent discharge to insure compliance with state water quality standards.

Section 7.5.9, Mitigation of Impacts to Lobster Habitat, p 7-108:
We support this proposal to remove all sizes of lobsters before disposal operations as a means to protect individual lobsters from impacts. However, this measure does not mitigate for adverse impacts to lobster habitat.

Section 7.1.3.2.3, Effects on... Fishing Industry, p 7-178 through 7-180:
As mentioned above and in our April 2, 2001 letter, this section should describe the impacts to the fishing activities in more detail. For example, what fisheries at the site would be most affected? Will the new sediment clog the cod-end mesh of draggermen? Will lobsters be able to use the mushy sediments to maintain burrows? If so, what will the effects of increased lobstering, if that occurs, as was the case at other New England disposal sites, e.g., Eatons Neck, Central Long Island Sound, New London, on other fisheries at the site (re: conflict of gear)? These issues need to be described as part of the site selection memorandum discussed below.

VOLUME II

Section 404 (b)(1) Evaluation:
Although the 404 evaluation acknowledges dewatering activities, it does not evaluate in harbor water quality impacts and whether the drainage and dewatering activities will comply with state water quality standards (Section 7.2.5.1). The Corps should provide a commitment to monitor this discharge to insure compliance with the state water quality standards..

We also would like the Corps to commit to monitoring the CAD cell water quality, as discussed above, to insure the uses of the harbor are protected.

The Section 404 evaluation does not include an evaluation of the Spar Island extension, which is listed as a preferred alternative. EPA believes this project is inconsistent with the 404 (b)(1) guidelines and that it should therefore be eliminated from the proposal. Any further consideration of this proposal should fully consider our comments on impacts to fisheries, should develop a detailed evaluation of the channel dredging (necessary to get the barge near the island) and the impact of fill on aquatic habitat and resources. The evaluation should also include secondary and cumulative effects of the proposal on already stressed fish populations in Mount Hope Bay.

APPENDIX P, MODELING

General Comment on Dredged Material Volumes:
Include a statement indicating that 5 mcy is a conservative estimate of volume at the disposal site, which accounts for the following:

- Volume at the dredging site is $V_{initial}$ with porosity $P_{initial}$
- Volume in the barge is V_{barge}=$V_{initial}$ - losses during dredging + change due to increased porosity P_{barge}
- Volume at the disposal site V_{final} = V_{barge} - losses during transport and placement + change due to increased porosity after placement P_{final}

Introduction

Study Objectives

Objectives No. 1, 4, and 5 are not objectives, they represent required input information to the models and they should be eliminated.

Chapter 2, STFATE Modeling:

Clumping Fraction

Although the word "clumps" is used for both the shear flume and the descending plume, it refers to different sizes. Indicate explicitly the size range of clumps in the dredged material and clumps eroded in the high-shear flume (based on the given fall velocity (3 fps) and specific gravity (1.33), the former is about 5 cm to 10 cm in diameter).

Results, Transport of Conservative Contaminants, p 22-24

The analytical development used to calculate the concentrations of conservative contaminants at the CAD cell incorrectly used longitudinal *dispersion,* rather than longitudinal *diffusion*. *Dispersion* is the result of lateral averaging and should not be used with a two- dimensional model as portrayed by Equation (2-1). Dispersion is appropriate for the one-dimensional model portrayed by Eq. (2-2), but only for the background concentration due to previous discharges, upon which recent discharges should be superimposed. As a result, the concentrations produced by this development are underestimated. Contrary to what is stated, the STFATE concentrations are more realistic.

Eq (2-1) is a vertically averaged solution of the mass conservation equation. We question whether this is appropriate, as one is concerned with exceedence of the criteria anywhere in the water column, not just as an average over the depth. Second, Eq.(2-1) contains a dispersion coefficient, $E_{L,}$ which reflects the averaging over the depth. This dispersion coefficient should be smaller than the dispersion coefficient in Eq. (2-2) which is averaged over the cross section. As a matter of fact, E_L in Eq(2-1) should be much smaller than E_L in Eq.(2-2) since dispersion in streams is mainly due to lateral velocity variations (Fischer *et al.*, 1979, p.128). Dispersion due to vertical shear is described by the Elder equation, and is about 40 times the transverse diffusion coefficient, ε_y (Fischer *et al*., 1979, p.109). Thus, with the estimate of ε_y = 2,800 ft^2/hr, the dispersion coefficient for use in Eq. (2-1) should be about 112,000 ft^2/hr or 35 times smaller than the value of 4 x 10^6 ft^2/hr that was used. Because of the extremely high value of E_L used in Eq (2-1) concentrations are underestimated.

Eq.(2-2), which is cross-section averaged, is appropriate for evaluation of the background concentration which will develop due to repeated dumps. In this equation, the value of E_L that was used, i.e. $E_L = 4 \times 10^6$ ft^2/hr, is appropriate. The background concentration shown in Figure 2-34 (b) is on the order of 0.035%, which is rather high compared to the 0.059% threshold.

It is not appropriate to use Eq. (2-2) to estimate concentrations 4 to 5 hours following a dump. For that, Eq.(2-1) should be used (assuming that depth average compliance with criteria is adequate) with the reduced value of E_L.

Reference: Fischer, H.B. *et al.* 1979. *Mixing in Inland and Coastal Waters.* Academic Press.

Chapter 4, Storm Simulations:

ADCIRC Model Validation

Explain why "the field data for elevation had to be shifted by 4 hours to concur with ADCIRC simulations." At face value this would suggest that the model has a significant flaw.

Please indicate the rationale and justification for using a two-dimensional (vertically averaged) model to model a stratified flow.

The comparison of velocities using data from the lower 20 ft of the water column is unjustified because the model used the full depth to account for the conservation of mass and momentum.

Please add a third column to the table in the June 8, 2001 response to our March 15, 2001 comment letter to show the relative differences (i.e., RMS difference/measured value: Elevation10-20%, Current magnitude 30-45%, East-West velocity 60%, and North-south velocity 35%). We note that the afore-mentioned table is not in the FEIS proper but exhibited in Appendix K of the FEIS as the June 8, 2001 letter to Roger Janson.

Knowing that model predictions are 30%-50% lower than measured values, please indicate clearly the actions that were considered to rectify the impact of these reduced velocities on bottom shear stress, erosion calculations, and mound stability.

Chapter 6, Erosional Modeling:

Consolidation Time

The time needed after dumping for the sediment to become consolidated, and hence acquire resistance to erosion, was not substantiated in the DEIS. To address this issue, centrifuge consolidation tests were conducted at the ERDC. However, the conclusions of these tests are unclear: *"The results, as it turned out, were not very useful for determining surface and shallow depth consolidation* (Vol. 1, p. 7-8, §3)." Another statement in this regard is: *" ¼ centrifuge experiments indicate that these*

sediments will consolidate fully (return to water content stratification similar to the in-situ material) within 1-2 years (App. P, p.94, §4)." No discussion or substantiation is provided for this statement and it is not clear how the time was arrived at given that tests were done for 1, 5 and 10 years.

One item that remains incompletely addressed is that of mound erosion prior to full consolidation. Some time will be required for sediment to consolidate following a dump, and acquire the erosion characteristics determined by the tests and used in the modeling: *"The sediment would lose some cohesion properties during disposal (resulting in erosion greater than the baseline scenario), but would regain erosion resistance with time as the material consolidates* (Vol. 1, p. 7-12, §3." As mentioned above, the time needed for this consolidation to occur has been estimated at 1-2 years. The remaining questions are: i) how much erosion will occur during this period, and ii) what will happen if a large storm occurs before consolidation is achieved? The frequency of these "large" storms is estimated at once in 20 to 40 years (App. P, p. 94, §4). Thus, the probability of a "large" storm occurring during 1-2 year consolidation time is 1/10 to 1/40. The magnitude of the impacts for this not-so-improbable event should be assessed as requested above.

LTFATE Model

Sediment transport simulations used velocities generated by ADCIRC (i.e., Table 4-3). But, the validation of ADCIRC (Section 4) indicated that the model underestimated velocities by ~50%. Transport simulations should be rectified to account for the anticipated actual velocities that are approximately twice the currently used values.

Mound Configurations

It is not clear that a bulking factor of 1.3 (30% increase in volume) was used to calculate the size of the mound at Site 69b and other sites as it was for the CAD cell. We could not substantiate that this was done. Discussions with Corps staff indicated that this was included in the modeling. For the record, please document in the response to comments on the FEIS that this was included in the modeling.

Sediment Transport Simulations

Tables 6-1b and 6-2b. There are significant changes in erosion depth and volume of erosion in the FEIS from the previously mentioned value in the draft version of these tables (Table 6-1b has values that are 1 to 4 orders of magnitude less than those mentioned in the draft version and Table 6-2b has values that are a factor of 3 to an order of magnitude higher). Five of the storms that showed erosion before do not show any erosion now. Through discussions with the Corps, we are satisfied with your explanation that the newly introduced erosion equation (Page 105, please give a number to this equation) and the modifications to the coefficients were responsible for this change and justified. The differences in these tables in comparison to previous model runs should be documented so that other reviewers can understand how the analysis was conducted.

STURM et al. 2000 Report

It is stated that *"We feel that the Fuller Rock and Sabin Point sediment adequately represent the material properties of the Bullock Point sediments"*. A more substantial justification is warranted.

Excluding data (up to 44%) to obtain a statistically significant regression represents a circular argument. For the presented argument to be valid:

- Properties of the "norm" should be identified and stated and;
- Cores with properties differing from the "norm" should be identified by means other than regression (e.g., physical and mechanical properties) and excluded a priori.

At Bullock Point all data did not produce a statistically significant regression. Does this mean that all data did not represent the "norm"? Then, what is the norm at Bullock Point?

Other modeling comments:

The FEIS indicates that the dimensions and orientation of Site 69b were (Figures 4.5.2-10 to 4.5.2-12 Please add colored legend to Figures 4.5.2-10 & 4.5.2-11, which will cause: (1) 23% reduction in its area, (2) change in bathymetry within the site, and (3) change in the angle of attack between ambient currents and the boundaries of the site. The effect of these changes on modeling results (Section 7.2 of Volume I and Appendix P) should be discussed. For example, results presented in Figure 7.2.2-9 may have to be modified.

Many statements are not substantiated by any reference or analysis, leaving questions as to their origin. For example:

- "Also, sensitivity analyses determined that movement would be initiated only after bottom velocities exceed 20 to 25 cm/s (8 to 10 in/sec), and/or wave heights exceed 10-12 ft (3 to 4.6 m). The frequency of this occurrence is conservatively estimated at less than 3 percent of the time... (Vol. 1, p.7-6, §3)" What is the basis for and how was that estimate developed?

- "As additional support of the high clumping factor, a method, developed by the Environmental Laboratory of the U.S. Army Engineer Research and Development Center (formerly Waterways Experiment Station), of estimating clump fraction based on the physical properties of the sediment was investigated (Vol. 1, p.7-7, §2)." No reference provided.

- "Processes for centrifuge studies concerning soil and sediment consolidation are well documented and frequently used, especially in soil/structure interaction. (Vol. 1, p.7-9, §3)" No reference provided.

- "The laboratory logbooks indicate that the sediment sample would bend and distort when exposed to strong currents, but would remain as a single mass until currents were great enough to produce shear stress of approximately 6 Pa. This behavior is similar to what has been seen in the past with sediment with a high content of material from the smectite family of clays (Vol. 1, p. 7-10, §3)." No reference provided for second part of statement, while experience with high critical shear stresses would help support the results obtained here.

Editorial Comments:
Figures need more clarification (Figures 1-1 and 1-2: need Latitude-Longitude coordinates, scale, north direction; Figures 6-3, 6-6, and 6-8: need to be rotated 90^{o} clockwise to be consistent with Figure 3-1 (North upward); Figures 6-5 to 6-9: need flow direction and North direction; Figures 6-1 to 6-9: need units on legend or in captions). Captions of Tables 6-1b and 6-2b should indicate "high erosion scenario."

APPENDIX L

***Table 4.3*:**
We believe the FEIS underestimates the economic impact on winter flounder. As outlined in our comments on the DEIS, we believe multiplying catches of winter flounder larvae by sector volume inflates the number of larvae in deep areas which are not known to be significant habitat for this species. The result of inflating fish numbers in deep water is an unrealistically small estimate of the proportion of the population affected by dredging in the project area. The Corps' response to date to our comments on this issue were not sufficient to dispel this belief. This problem is further exacerbated by using landing numbers to calculate the costs to the fishery. Landing numbers are based on fish that may have originated anywhere within the range of winter flounder, from as far south as New Jersey up to Maine. Narragansett Bay has its own unique population of winter flounder that return from offshore to spawn in the upper bay. We can all agree that it is important to protect the unique Narragansett Bay stock which has experienced significant declines over the last 20 years. We suggest the Corps use the available numbers on winter flounder larvae and convert them to adult equivalents and then compare these to estimates of the Narragansett Bay population.

The lack of other studies which show that all of the models work together to predict effects continues to be problematic. For example, there are some data available on the turbidity resulting from dredging operations, e.g. dredging in Boston Harbor. However, we are not aware of a study where these sorts of

models have been used to predict fisheries impacts, and where followup studies verify if the applied models accurately predicted biological impacts. We believe that this points to the need for monitoring for impacts and to the development of contingency plans to minimize any observed effects.